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Reports
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LOSS ASSESSMENT AND DEVELOPMENT OF MANAGEMENT
GUIDELINES FOR DWARF MISTLETOE-INFESTED
DOUGLAS-FIR STANDS IN THE SOUTHWEST

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LOSS ASSESSMENT AND DEVELOPMENT OF MANAGEMENT
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FIR STANDS IN THE SOUTHWEST

Progress Report

Submitted to the U. S. Forest Service

September 1979

Dates	Work Completed
February 1 - March 30	Completed project study plan and submitted the plan to the U. S. Forest Service for review.
April 1 - April 15	Located housing near the Apache-Sitgreaves National Forest. Ordered the necessary equipment for the study.
April 15 - June 10	Examined timber compartment exams for the Alpine, Luna, Reserve, and Springerville Ranger Districts and selected specific stands for field examination. Examined the selected stands in the field and recorded their location, stand composition, and approximate intensities of dwarf mistletoe infection.
June 11 - June 18	Began establishment of temporary growth plots in selected study areas.
June 19 - June 22	Met with representatives of the U. S. Forest Service to discuss the study plan and revise some of the data collection procedures.
June 23 - August 24	Established growth plots in selected study areas in the Apache-Sitgreaves National Forest. Data Collection is summarized under Plot Data Summary.
August 27 - August 31	Prepared progress report and budget for the next fiscal year for submission to the U. S. Forest Service.
September 1 - October 10	Approximately 35 - 40 plots will be completed in selected study areas in the Alpine Ranger District, Apache-Sitgreaves National Forest. It is probable that many more spread plots can be located in this District.
October 11 - October 30	Approximately 15 - 20 plots will be completed, Luna and Reserve Ranger Districts, Gila National Forest. Most of these plots will be in the Mogollon Mountains, New Mexico.

Dates	Work Completed
November 1 - November 30	Field plot data will be transferred to computer code forms, key punched, and analyzed at the University of Arizona's computer center.

Plot Data Summary

A. Growth Plots

1. Plots Completed:

As of August 24, 1979, seventy-eight temporary 0.2 acre growth plots have been completed and 5,287 Douglas-firs examined. The majority of these plots were within the Springerville Ranger District, Apache-Sitgreaves National Forest (see map). The northern part of the Springerville District (around Green's Peak) was logged between 1975 and 1978 and therefore only a few appropriate study areas were located in that area. Most of the study areas sampled were near the Baldy Wilderness, Big Lake, and southeast of Big Lake (see map). Almost all of the growth plots established in September and October will be in the Alpine Ranger District, Apache-Sitgreaves N. F. and in the Luna and Reserve Ranger Districts, Gila N. F. Most of the plots in the Gila N. F. will be in or near the Mogollon Mountains, New Mexico.

After consulting with U. S. Forest Service timber management personnel concerning the relatively low acreages of commercial mixed conifer forests within the Cibola, Coconino, and Coronado National Forests, I have decided not to establish growth plots in these forests this field season.

2. Stand History:

Thirty-four growth plots were completed in virgin mixed conifer stands and 44 plots were in cutover stands (Table 1). The majority of the plots in cutover stands have been in areas cut approximately 20 -25 years ago because several large timber ^Apoles were initiated

in the Apache - Sitgreaves N. F. in the late 1950's.

3. Dwarf Mistletoe Infection Levels:

I have been attempting to establish four plots in each study area selected; a plot with no dwarf mistletoe (DMR - 0), a plot with light mistletoe in the overstory (DMR - 0.1 - 1.5), a plot with moderate mistletoe in the overstory (DMR - 1.6 - 3.5), and a plot with heavy mistletoe (DMR - 3.6 - 6.0). However, this has not been possible in most of the study areas selected so far. I have had to use several study areas where I have been able to establish just 2 growth plots; one with light or no dwarf mistletoe in the overstory, and one with moderate or heavy mistletoe. I have been arbitrarily determining overstory infection levels by averaging dwarf mistletoe ratings for Douglas-firs greater than 10 inches DBH within a plot. Table 2 summarizes the overstory dwarf mistletoe infection levels that have been sampled.

4. Habitat Types and Douglas-fir Site Index:

Over one-half of the growth plots completed (43) have been in the *Picea pungens* - *Picea engelmannii*^A/*Erigeron superbis* Habitat Type (HT). This HT is the most common HT in commercial mixed conifer forests around Big Lake and near the Baldy Wilderness Area where most of the growth plots have been located. I feel this HT has been adequately sampled.

Fourteen plots have been established in the *Abies lasiocarpa*/*Erigeron superbis* HT and 17 plots have been in *Abies concolor* - *Pseudotsuga menziesii* Habitat Types (Table 3). Four plots have been in the *Picea pungens* - *Picea engelmannii*/*Senecio cardamine* HT.

There does not appear to be a close correlation between Douglas-fir site index and HT. Douglas-fir site indexes in the *Picea pungens*-*Picea engelmannii*/*Erigeron superb* and *Abies lasiocarpa*/*Erigeron superb* Habitat Types have ranged from the low 60's to 90 (Table 4). I believe the Habitat Type classification being used (Moir and Ludwig, 1979) can not be used for estimating Douglas-fir site indexes in mixed conifer forests in the Apache-Sitgreaves N.F.

Douglas-fir site indexes for the study areas sampled have ranged from 60 to 100 with most of the study areas having site indexes between 65 and 85 (Table 4).

5. Elevation, Slope, Aspect, and Age Classes:

Most of the plots completed have been at elevations between 9100 and 9300 feet and have been primarily at North, Northeast, and Northwest aspects with slopes less than 20 percent (Tables 5 and 6).

Over 400 Douglas-fir age classes have been sampled, but most of these have been less than 170 years (Table 7). Older age classes are found mainly in virgin stands, so it will be necessary to sample more virgin stands to obtain a larger sample of these age classes. Sampling very young Douglas-fir saplings (age class 0 - 10) will be difficult since few Douglas-firs reach the required 4.5 feet height in 10 years or less.

B. Spread Plots

1. Plots Completed:

It has been difficult to locate appropriate spread plots in the Springerville Ranger District. There are very few clearcuts or burns present and Douglas-fir reproduction does not predominate in the Habitat Types most common in mixed conifer forests within this Ranger District. Only 2 spread plots have been completed. I

feel I will be able to locate several more spread plots once I begin ^{more} work in the Alpine Ranger District.

2. Spread Rate:

The average rate of spread of *Arceuthobium douglasii* in the understory trees was 1.8 feet per year in both spread plots. The largest maximum distance of spread was 54 feet in trees averaging 30 years in age.

C. General Observations and Conclusions:

1. A general pattern of infection appears to be evident for young Douglas-firs in most study areas sampled. Douglas-fir saplings usually do not become infected before they are 25 - 30 years old. This generalized rule seems to be true even when the overstory is heavily infested.
2. Older Douglas-firs (130+) show a definite increase in growth after commercial logging in many study areas sampled. This growth response is often observed even in heavily infected Douglas-firs. I am not aware if there is a correlation between DMR and the amount of increased growth shown by the older Douglas-firs. Younger Douglas-firs also show an increased growth response after logging, but heavily infected trees in the younger age classes do not respond nearly as much as healthy or lightly infected trees.
3. Corkbark fir does not appear to be as susceptible to *A. douglasii* as previously thought. Approximately 5 to 25 percent of the corkbark firs in *A. douglasii* infested plots have been infected. Infections have been generally light on corkbark fir (DMR 1 - 3) and little mortality as a result of parasitism by *A. douglasii* has been observed in this ^{TREE} species. Therefore, I do not feel that *A. douglasii*

is a serious disease of corkbark fir in the Apache-Sitgreaves N. F.

4. Three incidences of parasitism of corkbark fir by *Arceuthobium microcarpum* have been found in the Apache-Sitgreaves N. F. this year. These are the first reports of this host-parasite combination in this N. F. I believe corkbark fir is definitely a rare host of *A. microcarpum* and *A. microcarpum* should not be considered as a potential disease problem on this host.
5. *Arceuthobium microcarpum* is a serious disease of Englemann and blue spruce in the Apache-Sitgreaves N. F. I have observed large numbers of dead spruce covered with witches' brooms in many localities (particularly along drainages). Only a few growth plots have been completed in stands where both spruce species were well represented and parasitized by *A. microcarpum*. Therefore, I have little numerical data concerning this disease problem so far.

Table 1. Stand History of Study Areas

<u>Stand History</u>	<u>Number of Plots</u>
Virgin	34
Cutover	
1935 - 1940	0
1941 - 1945	0
1946 - 1950	9
1951 - 1955	4
1956 - 1960	26
1961 - 1965	5
1966 +	<u>0</u>
Total 78 Plots	

Table 2. Average Overstory¹ Dwarf Mistletoe Rating

<u>DMR</u>	<u>Number of Plots</u>
0	16
0.1 - 1.5	18
1.6 - 3.5	24
3.6 - 6.0	<u>20</u>
	78 Plots

¹ Trees greater than 10 inches DBH.

Table 3. Habitat Types Sampled¹

Habitat Type	Number of Plots
<i>Picea pungens</i> - <i>Picea engelmannii</i> / <i>Erigeron superbis</i>	43
<i>Abies lasiocarpa</i> / <i>Erigeron superbis</i>	14
<i>Abies concolor</i> - <i>Pseudotsuga menziesii</i> / <i>Erigeron superbis</i>	9
<i>Abies concolor</i> - <i>Pseudotsuga menziesii</i>	8
<i>Picea pungens</i> - <i>Picea engelmannii</i> / <i>Senecio cardamine</i>	4

¹ Classification of Habitat Types by Moir, W. H., and J. A. Ludwig. 1979. A classification of spruce-fir and mixed conifer habitat types of Arizona and New Mexico. USDA For. Serv. Res. Paper RM-207, 47 p.

Table 4. Habitat Types and Douglas-fir Site Index

Site Index ¹⁰	Number of Study Areas				
110	0	0	0	0	0
100	0	0	0	0	1
95	0	0	0	0	0
90	1	1	1	0	0
85	2	0	0	0	0
80	4	2	2	0	0
75	4	2	1	0	0
70	4	3	0	1	0
65	4	0	0	0	0
60	0	1	0	1	0
55	0	0	0	0	0
50	0	0	0	0	0
	19	9	4	2	1
	1	2	3	4	5

Habitat Type

1. *Picea pungens*-*Picea engelmannii*/*Erigeron superbis* HT
 2. *Abies lasiocarpa*/*Erigeron superbis* HT
 3. *Abies concolor*-*Pseudotsuga menziesii*/*Erigeron superbis* HT
 4. *Abies concolor*-*Pseudotsuga menziesii* HT
 5. *Picea pungens*-*Picea engelmannii*/*Senecio cardamine* HT
10. Site index determined using Edminster, C. B., and L. H. Jump. 1976. Site index curves for Douglas-fir in New Mexico. USDA For. Serv. Res. Note RM-326, 3 p.

Table 5. Elevation of Plots

<u>Elevation (feet)</u>	<u>Number of Plots</u>
8000	3
8100	0
8200	0
8300	0
8400	0
8500	0
8600	4
8700	2
8800	4
8900	4
9000	4
9100	19
9200	12
9300	15
9400	5
9500	2
9600	3
9700	2
9800	0
9900	0

Total = 78 Plots

Table 6. Aspect and Slope

Slope ¹ (%)										Total 78 plots
	N	E	S	W	NE	SW	SE	NW	Ridgetop	
50	0	0	0	0	0	0	0	0	0	
45	0	0	0	0	0	0	0	0	0	
40	4	0	0	0	0	0	0	0	1	
35	0	0	1	0	0	0	0	0	0	
30	3	1	0	0	0	0	0	0	1	
25	0	0	1	0	2	1	0	0	1	
20	5	0	0	0	0	1	0	0	3	
15	4	0	0	0	2	0	0	0	1	
10	4	0	0	0	4	0	2	2	4	
5	7	1	0	1	4	9	2	2	3	
0										5

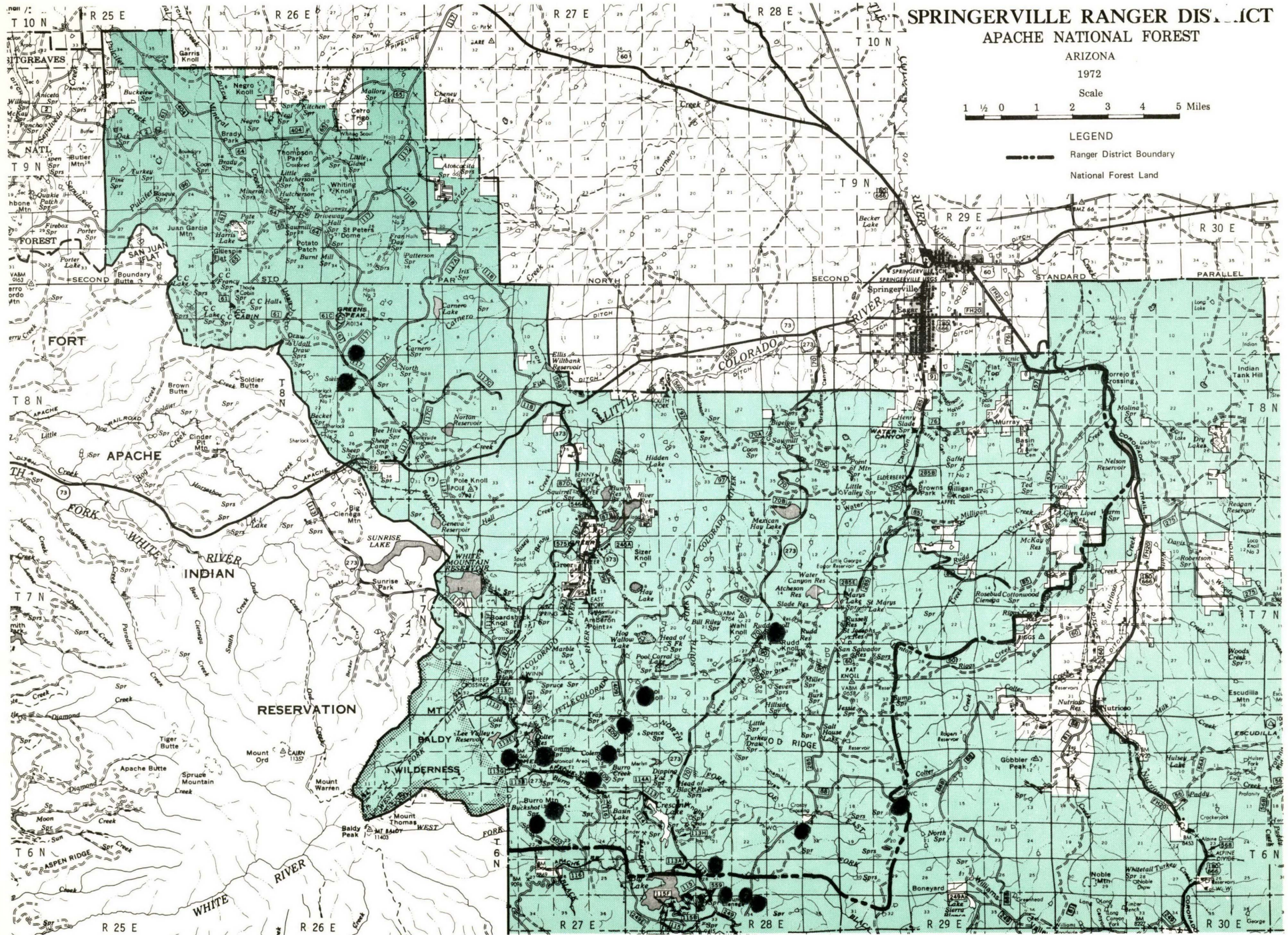
Aspect

¹ Slopes rounded to the nearest 5 percent.

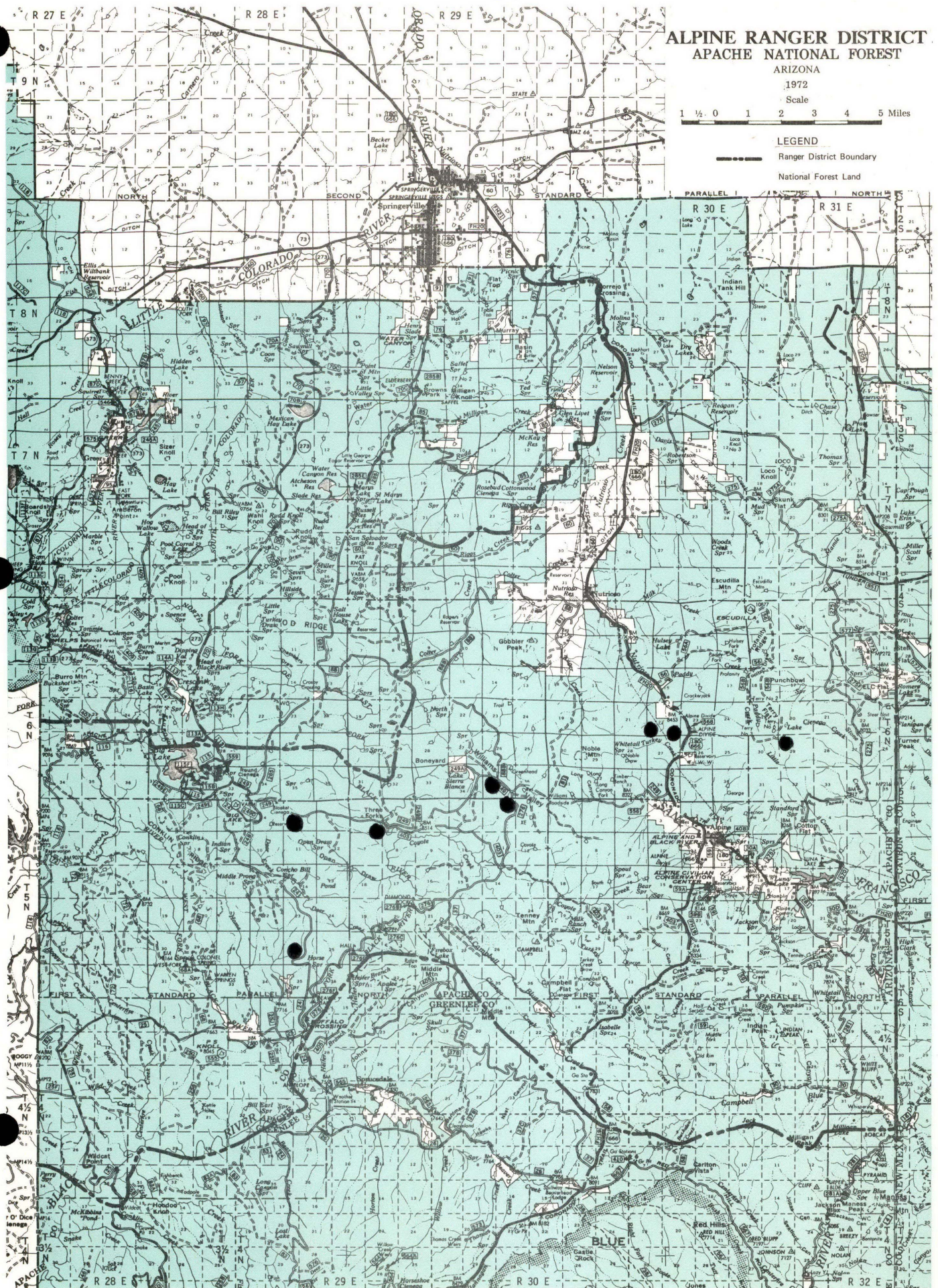
Table 7. Douglas-fir Age Classes

<u>Age Class</u>	<u>Number Sampled</u>
0 - 10	0
10 - 30	40
30 - 50	62
50 - 70	55
70 - 90	34
90 - 110	61
110 - 130	28
130 - 150	51
150 - 170	19
170 - 190	20
190 - 210	8
210 - 230	6
230 - 250	1
250 +	16
<hr/>	
Total - 401	

STUDY AREAS SAMPLED - ●



STUDY AREAS SAMPLED



STUDY AREAS SAMPLED -

ALPINE

BLACK RIVER RANGER DISTRICT APACHE NATIONAL FOREST

ARIZONA

1972

Scale

1 1/4 0 1 2 3 4 5 Miles

LEGEND

- Ranger District Boundary
- National Forest Land

